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Manuscript Report 219e

Epidemiologic Assessment of Acute Poisoning Incidence in Developing Countries

April 1989

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IDRC-MR219e

EPIDEMIOLOGIC ASSESSMENT OF ACUTE POISONING INCIDENCE IN DEVELOPING COUNTRIES

Report of an
International Development Research Centre/
International Program for Chemical Safety
Scientific Group

Edited by
Gilles Forget

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90-00249/

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FOREWORD

In March 1988, the International Development Research Centre (IDRC) and the International Program for Chemical Safety of the World Health Organization (IPCS/WHO) jointly organized a workshop where they invited a group of international experts. The group's mandate was to prepare a final version of an epidemiological protocol to evaluate the incidence of acute poisonings in developing countries.

IDRC and IPCS are interested in the different aspects concerning the establishment of poison information centres. This common interest brought about the collaboration of the two organizations on several discrete projects in this field. IDRC's Health Sciences Division is involved particularly with studies of the impact of poison information centres on the health of third world communities. In the course of these activities, it was soon discovered that the methodologies to measure such impact were ill-defined.

At IDRC's request, Doctors Fernand Turcotte and Patrick Levallois of the Université Laval, Québec, undertook the formulation of a certain number of strategies which would allow field-surveys of poisoning incidence. These strategies had to take into account conditions prevailing in the third-world.

Jointly with the IPCS and the Centro Panamericano de Ecologia Humana y Salud (ECO) of the Pan-American Health Organization, IDRC identified 10 international experts (toxicologists, epidemiologists and poison-information centre specialists) who were invited to the Cairo workshop from March 14 to 18 1988. This report is the result of their deliberations.

The first part of this document will allow the readers to familiarize themselves with the basic information which were available to the participants at the time of the workshop, and which were used to formulate the methodology outlined in part two of the report. IDRC will publish this protocol separately in the form of a booklet to facilitate its diffusion.

I would like in closing to thank all my colleagues who participated directly or indirectly to the preparation of this protocol. I am particularly grateful to Dr. Fawzy Kishk, Regional Director of IDRC's Regional office for the Middle-East, who organized the Cairo meeting; Dr. Jacobo Finkleman, Director of the ECO program of PAHO, who kindly identified the Latin-american participants; Doctors P. M. Bernard, J. Brisson, and P. Gosselin, faculty of medicine of the Université Laval (Canada) as well as Dr. Albert Nantel, Director of the Centre anti-poison du Québec (Canada) who acted as consultants for the preparation of the working document; finally, I would like to thank my colleague John Haynes of the IPCS whose ever-sustained interest and enthusiasm facilitated the production of tangible results from this IDRC/IPCS collaboration.

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INTRODUCTION

Poisoning is recognized as an important health problem in industrialized countries, particularly in childhood (VALE 1981, MMWR 1985). While the exact dimensions of this problem are not yet clearly defined in those countries, poisoning is still ill defined in most developing countries. Nevertheless the industrialization of these countries brings about lots of chemicals, put to use in a vacuum of proper regulations. When such a situation is associated with a lack of awareness of the local population about toxics in general, those countries become at high risk for poisoning. Studies from Sri Lanka have demonstrated the risk of pesticide poisoning in countries using agricultural chemicals (SENEMIRATNE 1974, JEYARATNAM, 1982) but data for most developing countries are still lacking. Recently, Jeyaratnam has called for more research in that area since he felt the majority of pesticide poisonings occur in developing countries (JEYARATNAM, 1985).

Estimating the incidence of poisoning is essential to understand this problem and to rank it accordingly among other national health priorities. The resources vested in the solution of a given problem are determined in part by it's frequency and it's severity. Studying incidence of poisoning is also important to follow over time trends of this problem, especially when implementing some form of control intervention.

In this paper, we propose some general guidelines related to the study of incidence of poisoning in a developing country. To estimate the true incidence rate of poisoning, there are different possibles strategies depending on the situation of the country. To begin with, the first step is to define clearly what is the ultimate aim of the study and what the study proposes to do. It is important to identify the variety(ies) of poisoning that need to be studied and the main sources of data available for such a study. It then becomes possible to select the appropriate strategy.

Each type of poisoning under study has to be characterized in terms of severity. The description of poisoning calls for some understanding of host characteristics, of substances involved as well as the main environmental circumstances. This knowledge depends on a proper collection of variables, which calls for "a priori" solutions to problems of variable definition and classification. Finally, incidence rates and mortality rates may be obtained, when it is possible, to estimate the size and some characteristics of the population at risk.

Epidemiology is defined as "the study of the distribution and determinants of diseases and injuries in human populations" (MAUSNER, 1985). Descriptive epidemiologic studies examine the frequency of illnesses while analytic studies look for causal factors. The two types of study have their specific objectives and consequently specific requirements (ANDERSON, 1983).

A descriptive study done according to these guidelines would focus on the frequency of morbidity and mortality due to poisoning. A thorough description of the characteristics of the host, the agent and the circumstances of poisoning may give some understanding of the etiology of this problem and point to obvious interventions. But the precise knowledge of causal pathways calls, most of the time, for analytical studies (CHRISTEN 1981, OLSON 1985). This falls beyond the scope of this paper.

PART 1: GENERAL GUIDELINES

I MEASURES OF INCIDENCE AND MORTALITY

Measures of incidence and mortality are the basic measures used for descriptive epidemiology. A summary review of these measures is presented in relation to poisoning.

- Incident cases: these are new cases of poisoning occurring in a predetermined period of time.

- Incidence rates: these rates are made of the number of new cases of poisoning occurring in a predetermined period of time, divided by the population-time at risk from which the cases are drawn. Usually this population-time can be considered as the product of population size by the average time period of observation for a member of the population. Incidence rates are measurements of the dynamics of the problem in a population. These rates are very useful to allow for comparisons of the same problem as it occurs in different populations.

Incidence rates describe the rate of occurrence of poisoning. Three elements of information are required to compute valid incidence rates: precise and complete knowledge of poisoning cases occurring in the population, a clearly determined period of time and the census of the population where cases come from, which is defined as the population at risk.

- Deaths : deaths caused explicitly by poisoning, occurring in a predetermined period of time.

- Mortality rates : numbers of deaths by poisoning, occurring in a predetermined period of time, divided by the population-time at risk.

- Case fatality ratio (CFR): number of deaths by poisoning divided by the total number of incident cases of poisoning during the period of time under study. This measure is used to compare the relative severity of different types of poisoning. The case fatality ratio is also used to assess the validity or utility of treatments, a more effective treatment lowering sensibly the value of that index.

When mortality data are not available or not reliable, a case severity index may be computed using numbers of severe cases in the numerator and total numbers of incident cases in the denominator.

- Proportional mortality ratio (PMR): number of deaths due to poisoning over a predetermined period of time, divided by the total number of deaths occurring in the same period of time. This ratio describes the relative importance of death by poisoning among the total mortality and may be used to estimate the reduction of premature mortality that could be achieved by a reduction of poisoning.

II DEFINITION OF CASES OF ACUTE POISONING

Acute poisoning is usually defined by toxicologists as the result of an acute exposure to toxic substances. Acute exposure refers to an exposure to the substance for less than 24 hours as opposed to repeated exposures. Subacute exposure refers to repeated exposure to a chemical for one month or less. Subchronic exposure means exposure from one to three months and chronic for more than three months (KLAASSEN, 1986). Exposure may induce immediate effects and delayed effects.

The definition of cases of acute poisoning may be made through the assessment of exposure, the clinical manifestations and laboratory findings. Once identified, cases of poisoning are to be classified according to the severity of effects.

A - Definitions

- Exposure to toxic substances

"Stricto sensu", poisoning is "the condition produced by a poison or a toxic substance" (Random House Dictionnary, 1969). Poisoning refers to the toxic effects of a poison. Sometimes, this definition may prove inadequate. The effects of a poison may not become manifest because of intercurrent treatment or the low susceptibility of the "poisoned" person.

One way around this difficulty is to define poisoning as any exposure to a toxic quantity of a poison. Unfortunately, it is not always possible to quantify precisely the exposure to a toxic and a precisely defined toxic dose is not set for every toxic substance.

Poison control professionals have temporarily solved these difficulties by extending the definition of poisoning to any exposure to poison, regardless of the dose and of the effect on the "poisoned" person (GOULDING, 1987, BUZIK, 1986). When planning to estimate incident poisoning, one should be aware of the risk of under - and overestimation linked to the definition being used. For instance, contacts with a poison are likely to be more frequent than contacts with a toxic quantity of the same poison, or contacts followed by a clinical syndrome. Each of these definitions, while legitimate per se, provides estimations of incidence that are below or beyond the true incidence of poisoning defined as exposure with clinical signs.

- Clinical manifestations

In the great majority of cases, the diagnosis of acute poisoning is based on the history provided by patients, by witnesses of the episode or on circumstancial evidence (PROUDFOOT, 1982). Sometimes, it is impossible to have a history but the clinical signs are suggestive of a specific type of poisoning (OLSON, 1987).

In some cases, the picture is atypical because of the absence of history and the presence of atypical clinical signs or symptoms. In those cases, it could be difficult to ascertain a diagnosis of poisoning without toxicological laboratory analysis.

Acute poisonings with immediate effects are usually well recognized because of the association within a short period of time between the exposure to a toxic substance and the appearance of symptoms and signs. Delayed effects are more difficult to associate with an exposure because of elapsed time and/or the occurrence of more subtle or atypical disorders. The scope of this paper is limited to the study of the immediate effects of acute poisoning and does not address the problem of delayed toxicity. In some cases the dividing line is not clearly defined and delayed manifestations could be immediate effects that have been overlooked (WEISS, 1986). This underestimation of the number of incident cases of acute poisoning may occur through atypical delayed, or heretofore unknown clinical manifestations of poisoning. This must be born in mind when planning a study and interpreting data about acute poisoning incidence.

- Laboratory diagnosis

There is agreement in the literature on the fact that diagnosis of poisoning can be done in the vast majority of cases without laboratory services (WIDDOP, 1981, PROUDFOOT, 1982, ELLENHORN, 1987). But to settle atypical problems, accessibility to a toxicology laboratory may be necessary.

With scarce resources, one could limit the use of the laboratory to patients with major signs and symptoms of poisoning (ELLENHORN, 1987). It could also prove useful for the study of deaths allegedly due to poisoning (NORTON, 1982, GARRIOT, 1982). Risks of misclassification of the substances involved are high when the evaluation relies only on the clinical elements and cannot seek confirmation in a toxicology laboratory, especially in the milder forms of poisoning or in polyintoxications (HEPLER, 1986).

One should be aware of the technical limitations of toxicology laboratories. First, these laboratories are well equipped for the identification of drug intoxications but less so for general chemical intoxications. Second, a positive result may only be a sign of exposure and needs to be interpreted along with clinical signs and history (NORTON, 1982, GARRIOT, 1982). In other instances, a positive laboratory result is the signature of poisoning and severity (vg. acetaminophen, organophosphate pesticides).

A solution to this problem is to take account of the uncertainty of the diagnosis by classifying cases with a qualified probability of diagnosis as did Joubert et al. while attempting to estimate incident cases of poisoning. The following categories have been used: possible, probable, and definite poisoning (JOUBERT, 1982). In summary, the proper definition of poisoning cases calls for standardized criteria of exposure, of clinical manifestations and for laboratory diagnosis. These criteria should be well known, currently used and closely monitored during data collection.

B - Classifications by severity

When describing the incidence of poisoning, it is useful and important to use crude as well as stratified data. One critical stratification considers severity of poisoning. This stratification gives a more precise description of the actual health burden related to poisoning and solves some of the problems of definition discussed earlier. Two scales of severity are commonly used:

1) The American Poison Centers Classification (VELTRI, 1987).

In order to classify clinical outcomes of poisoning, the following severity scale is used (Appendix I):

No effect

Minor effect (minor symptoms with rapid resolution)

Moderate effect (treatment needed but no residual disability)

Major effect (life threatening or results in residual disability)

Death (as a result or a complication of the exposure)

Unrelated effects

Unknown

This scale is simple, easy to use and comprehensive in terms of effects of exposures to a poison. In as much as the use of this scale is spreading rapidly, interregional and international comparisons of poisoning by severity of episodes or outcomes will be made much easier.

2) Scale based on health services utilization

This scale is the one most commonly used in descriptive studies based on health services utilization data or on registries. The scale is made of 3 classes:

- **emergency department consultation data;**
- **hospitalization data;**
- **death registers.**

This scale is easy to use when access to a valid data base is possible and provides a shortcut to the stratification for the severity of poisoning. The validity of these data bases depends on the accessibility of health services and the quality of death registration. Length of hospital stay may be used to distinguish moderate and severe cases of poisoning for instance.

III VARIABLES OF INTEREST

To improve descriptions of the occurrence of poisoning it is useful to produce incidence data along elements derived from the "agent-host-environment" model. Each of the three components of the model may provide a classification.

This model, used to classify variables related to the occurrence of diseases in a population, has been used widely in the epidemiology of injury and poisoning (GUYER, 1985, OLSON, 1985).

Interactions between these 3 groups of variables or factors influence poisoning.

The agent is the substance involved in poisoning. The host refers to the persons who are susceptible to poisoning. The environment includes all other factors, principally the environmental circumstances of poisoning.

1. Host characteristics

For descriptive purposes it is important to record some characteristics of the cases and of the populations that are at increased risk. Age, sex, ethnic origin, marital status, socio-economic class, occupation, residence, are the main variables which are to be collected for this purpose.

2. Characteristics of agents

International Classification of Diseases, 9th Revision (ICD-9) provides a classification based on the clinical nature of poisoning which uses substances involved in poisoning (WHO-1977).

- intoxications by drugs and biological products (codes 960-979)

- intoxications by non medical substances (codes 980-989)

This classification is widely used in hospital discharge abstracts and has been utilized to study the incidence of poisoning (GALLAGHER, 1984, TRINKOFF, 1986). Utilized all over the world, it is also quite comprehensive for intoxications with medical preparations. But for other varieties of poisoning it is crude and not very practical. Other classifications have been proposed as the classification used by Health and Welfare Canada (HWC 1985) (Appendix II). This classification seems quite simple and is well adapted for North American needs.

Other agencies and organizations are currently working on different classifications such as the International Program on Chemical Safety (IPCS) which is drawing a classification to be used by poison control centers.

While it is difficult to draft a classification that will meet the needs of all countries, it is mandatory to adopt one, broad in scope, that may be modified to cope with specific needs. Information about the agent, the doses, duration and routes of exposure are also of utmost importance.

3. Environmental circumstances

The realization of analytic studies requires some knowledge about all critical determinants of illness, hence the need to specify very precisely the circumstances surrounding poisoning. In a descriptive study, broad classes of environmental circumstances of poisoning, as proposed by A. Proudfoot (1982) may be sufficient:

- **accidental poisoning**
- **deliberate poisoning**
- **homicidal poisoning**
- **non-accidental poisoning** (extension of the battered-child syndrome)

The American Association of Poison Control Centers proposed a more precise circumstantial classification (LITOVITZ, 1987):

1) **Accidental**	2) **Intentional**
.general .environmental .misuse .occupational .unknown	.suicide .misuse .abuse .unknown
3) **Adverse Reaction**	4) **Unknown**

ICD-9 also proposes a classification based on environmental circumstances, which is quite exhaustive:

1. accidental poisoning by drugs, medicaments and biologicals (E-850 - E-858);
2. accidental poisoning by other solid and liquid substances, gases or vapours (E-860 - E-869);
3. venomous animals and plants as the cause of poisoning and toxic reactions (E-905);
4. drugs, medicaments and biological substances causing adverse effects in the therapeutic use (E-930- E-949);
5. suicide and self-inflicted injury (E-950 - E-959);
6. homicide and injury purposely inflicted by other persons (E-960 - E-969);
7. unknown (E-980 - E-989).

This classification, because it attempts to describe the environmental circumstances and the agent simultaneously, becomes very complex and introduces significant overlapping with the classification by agent. These two factors seriously impair the utility of this classification.

More descriptive data about the circumstances and place of occurrence of poisoning may be needed. IPCS has designed the following classification, for this specific purpose:

Location: Home and surroundings

Workplace

- factory
- workshop
- laboratory
- agriculture/horticulture
- other

Community

- nursery or primary school
- other school, university, other educational
- hospital, clinic, nursing home
- institution: prison, military, other
- other

Enclosed public place

- shops, cinema, sports centre, other

Open places

- highway, sports ground, parks, other

Unknown

In summary, the study of incident cases of poisoning requires the collection of standardized data. Standardization depends on methods and criteria used to collect and to classify data. A classification of poisoning has to consider data related to the severity of episodes, the agents involved, some characteristics of the host and environmental circumstances. These data are to be made as exhaustive as feasible and grouped in mutually exclusive classes.

IV POPULATION AT RISK

The incidence rate of poisoning is made of two numbers. The numerator of that rate is the total number of new cases of poisoning occurring in a given period, while the denominator is equal to the population-time at risk from which the new cases are drawn. This reference population may be defined by some geo-political boundaries or by other variables (age, sex, occupation, site of residence, etc.).

Isolated total numbers of acute poisoning cases are of limited utility because they do not take populations at risk into account. Incidence and mortality rates make international and interregional comparisons possible. These rates may only be computed when the size and some characteristics of the population-time at risk are known.

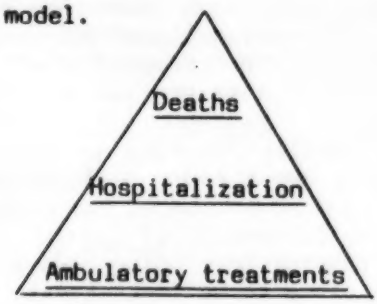
Denominators of rates are usually provided by census data which are collected, in most countries, about every 5 or 10 years. Estimations of the rate of variations occurring between two censuses are essential and usually derived from the processing of birth, death and migration registries or records. In several developing countries, the continuous use of a civil register may prove to be impractical, fastidious and too expensive. These registers are often unsatisfactory because of missing data (UNITED NATIONS, 1985). Because of these limitations, some countries try to substitute some valid estimates of population to civil registries. These estimates may be obtained by a continuous sampling survey of births and deaths, using a particular set of areas as units of sampling. As currently done in India, strict quality control and good statistical methods, provide valid estimates of the size and characteristics of the studied population (UNITED NATIONS, 1985). Other sources may be used to describe some subsets of the population at risk: social security records, corporate records or immunization registers.

The assessment of poisoning rates depends on denominators which are used. The accuracy of these data has to be probed in order to estimate the distortion they may introduce on the rates. Finding the denominator from where cases making the numerator, are drawn, is the most difficult problem faced by this type of study. For instance, cases collected in a hospital have to be linked with some form of a geographically defined population. The boundaries of this population define the catchment area of the hospital, provided one can ascertain that there is no selection mechanism, interfering with access to that hospital. Once the population at risk is well defined, population-time at risk will be calculated using the average time of observation for a member of the population.

V DATA COLLECTION

The estimation of the incidence of poisoning depends, as was discussed earlier, on the definition of poisoning. Let us, for instance, use the clearest example such as a case of acute poisoning defined as a case of exposure to a toxic rapidly followed by the occurrence of clinical signs of poisoning. The estimation of the incidence of such cases will depend on the criteria and methods used to compute cases. It is usual to describe the burden of disease injury with the "iceberg" model.

Figure I: The iceberg model.



Increasing levels of medical interventions represent increasing levels of illness severity. According to the type of health services utilization data used in this process, one will obtain different varieties of incidence frequencies.

For instance in the U.S.A., the following numbers of annual cases and rates of poisoning among children under five years of age, are reported for 1980 (MMWR, 1985).

Outcomes	Numbers	Rates[1]
Deaths	57	0,3
Hospitalizations	20 000	122,3
Emergency room visits	110 000	672,9
Calls to Poison-control Centers	1 400 000	8 563,6

[1] per 100 000 children ages 0-4 years in 1980.

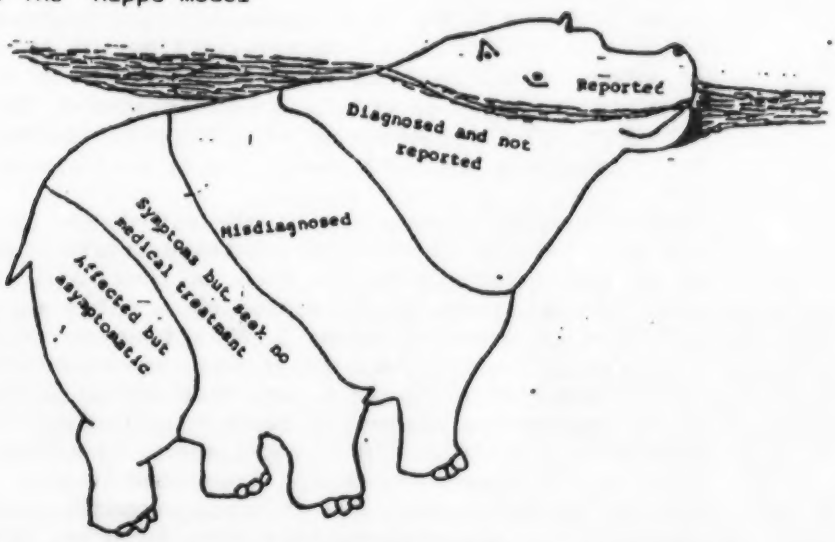
According to that table, for each fatal poisoning occurring in children aged 0-4 years, one would expect to see 408 admissions to hospitals, 2 241 emergency room visits and 28 545 calls to poison-control centers.

A VENN diagram illustrates the relationships of these data. While there is some overlapping of the three classes of outcomes, some of the incident cases are not included in any of the classes.

Figure 2: Venn Diagram

Poisoning is a multifaceted problem, depending on the part of the problem that comes to scrutiny. The "hippo model" provides one of the best illustrations of this reality.

Figure 3: The "hippo model"



Under routine reporting, only a fraction of cases are ever known. When medical services data are used in a study, only those cases that were diagnosed are used. Some underestimation of the frequency of cases may be due to missed diagnosis. This source of error may be corrected in a prospective design where diagnostic skills may be improved. People with symptoms who do not seek care may only be found through either improved access to health services or through population surveys.

Among cases affected but asymptomatic, only a population survey with clinical or biological investigation will identify them.

A - SOURCES OF DATA

The main sources of data are medical services data (hospitalization and ambulatory services), mortality statistics, poison control center data and population surveys.

1. Hospitalization data

These data provide a simple method to describe severe poisoning in a country and have been used frequently.

Among the advantages of hospitalization data, the availability of medical ascertainement of cases and the ready identification of the more severe cases, stand on the forefront. Problems affecting the utility of hospital data in epidemiologic research have been reviewed and reported some time ago (MASI, 1965).

First: hospital records are not always readily usable for research because of: a) incomplete and non-standardized information; b) substantial diagnosis variability among hospitals. These problems might be overcome in a prospective study design, where standardization of data collection has been pre-arranged. In somes cases, hospital records, despite all their potential short-comings, may prove to be quite useful to provide broad estimates of the nosetip of the "hippo" : poisonings that are most frequently encountered.

Second: hospital cases are highly vulnerable to selection bias not only because of clinical characteristics, but also because of personal characteristics such as race, sex, age, socio-economic status, place of residence, etc.. This may lead to biased estimates of incident cases. This bias is very difficult to overcome. The only way is to use, when possible, population based hospital data sets, so that hospital cases will thus become representative of all cases of poisoning requiring admission to a hospital. But if admissions to a hospital are, anywhere in the area under study, submitted to some form of selection by reason of race, sex or socio-economic status, it is mandatory to try to overcome this bias by using other sources of data such as ambulatory services data. In those circumstances, ambulatory data collection will be restricted to cases of poisoning which have not been transfered to hospitals. On the other hand, accessibility to these services for all population groups will have to be ascertained before this method may be used.

Third: hospital cases will always be short of many fatal cases of poisoning, because of deaths occurring before admission is at all possible. In the United Kingdom, it has been estimated that about 80 per cent of all deaths from acute poisoning occur outside hospitals (Central and Scottish Health Services Councils 1968 cited by J A VALE, 1977) and it is probable that this proportion may be larger in developing countries. So to describe accurately severe incident cases of poisoning, hospital data must always be supplemented by the study of mortality occurring outside of hospitals (GALLAGHER, 1984, JACOBSEN, 1984). An operational definition of acute incident case of poisoning in this kind of study is: "an acute exposure to a drug or another agent in assumed toxic amounts leading to hospital admission or death outside hospitals" (JACOBSEN, 1984).

2. Ambulatory Services Data

In some countries many, if not most, seriously ill patients never reach a hospital (PHOON, 1982) but they may have sought ambulatory care from health centers or private physicians. This is a first good reason to analyse ambulatory care data sets. Second, since most poisonings are mild and are managed in ambulatory care settings, the proper assessment of poisoning, requires that data describing patients seen in hospital outpatient departments and other ambulatory care facilities be examined. This type of data is also subject to selection bias. Although coverage of the population may be more extensive because of better geographical distribution of these facilities, those living nearby and those with greater financial means will tend to be over represented.

The proper interpretation of ambulatory care data requires well grounded knowledge about access to services. One method of reducing selection bias is to improve, at least for the duration of a prospective study, access to these services.

3. Mortality statistics

Any study of the incidence of severe poisoning must consider mortality data which are routinely collected in registries. These data provide information on numbers and certain specific distributions of deaths and, in most jurisdictions, on causes of death. The quality of information depends on collection methods.

In industrialized countries, death registration is considered to be quite exhaustive but problems remain in relation to death certification (SIRKEN, 1987, FDA, 1984). In most developing countries substantial proportions of deaths remain unregistered, and death certification is often of doubtful accuracy and generally available only for patients having passed away in

hospitals (PHOON, 1985). Even when all deaths are reported and certified, the accuracy of the cause of death may be doubtful when some legal implications are linked to homicides and suicides. Under those circumstances, the only way to estimate accurately true mortality data due to poisoning could be to set up a prospective mortality study. In this type of study, all deaths must, for a certain period of time, be registered and causes of death, be ascertained by specific enquiry. Major difficulties may be encountered when accuracy constraints call for laboratory and post-mortem examinations if such procedure are incompatible with prevailing cultural values or the availability of technical facilities.

4. Poison Control Centers Data

While the primary objective of poison control services is the proper management of acute poisoning emergencies, other supporting functions such as collection and analysis of patient experience data are provided (VELTRI, 1982). Considerable efforts have gone into the standardization of data collection within poison control centers so that data originating from many centers may be pooled and properly analysed. IPCS is currently developing ways and means for poison control centers to collect and analyse data. Despite these efforts, data produced by Poison Control Services are still subject to many limitations (CHRISTEN, 1983, GOULDING, 1987, VELTRI, 1987).

First, incident cases of poisoning contacting poison control centers are submitted to selection bias, accessibility being the major determinant of the selective use of such centers. Accessibility may be related to geographical factors or other socio-demographic variables. The more severe poisoning will select out the worst cases through early death or through the chanelling of these cases to other health professionals, in lieu of the Poison Control Center.

Even in industrialized countries, cases reported by poison-control centers are always subjected to selection bias. It is because of this bias that the American Association of Poison Control Centers uses the "penetrance rate" rather than the incidence rate in reporting about cases seen in a center, as referred to the reference population they are deemed to come from (LITOVITZ, 1987).

Second, methods used to define cases may elicit over - and under - reporting. Calls about suspected poisoning may be classified as definite poisoning cases and there is no means of otherwise ascertaining the validity of such case handling, although this may be partially neutralized with stratification by clinical outcome of poisoning.

In summary, it is hazardous to rely solely on poison-control centers'data to estimate the true incidence of poisoning, in a country. But this data can provide estimates of the importance of poisoning in the catchment area and useful clues to many critical aspects of this problem (FAHIM, 1983). In some cases such as when poison-control centers dispense antidotes, the data may be very precise.

5. Population surveys

The only way to estimate most incident cases is to conduct a population survey based on a representative sample of the total population. This method has been used to estimate the true incidence rates of poisoning in childhood, through a telephone survey of a representative sample of households (BUZIK, 1986, KLAUBER, 1986). This method has also been used in the context of developing countries, subsituting face to face encounters for telephone interviews, to study pesticide poisoning incidence in agricultural workers (BAKER, 1978, JEYARATNAM, 1987). This method has some inherent limitations.

First, by this method one cannot collect medical confirmation of cases of poisoning but histories of exposure and related symptoms reported to the interviewers. In one such study, ingestion of anything that respondents considered poisonous was defined as cases of poisoning (KLAUBER, 1986). Such policy elicits substantial over-estimation of incident poisoning. This could be controlled by the use of clinical or biological examination at the time of the interview (BAKER, 1978). As in other crossectional studies, more severe cases will be under-represented.

Second, interviews depend on memories. The length of the periods about which memories are probed, may have to be substantial, especially when the event studied is relatively rare and sufficient numbers of events are to be collected. In his study, BUZIC (1986) collected poisonings, based on a recall period of one year. This method leads to obvious recall bias.

Third, because this method is also subject to response bias in view of constraints related to legal inquiries as they might apply to self poisoning or suicidal attempts, it's use is restricted to the study of accidental poisonings as childhood and occupationally related poisonings.

Fourth, in order to foster acceptable precision levels of the estimates, this method may only be used to study the incidence of frequent events such as minor poisonings. Accurate estimations of severe poisonings, because they are rare events, will require very large samples of population and thus become prohibitively costly. One practical way of overcoming these limitations is to restrict the use of population studies to high risk

groups such as children exposed to households poisons, or agricultural workers exposed to pesticides etc. For specified types of poisoning, this provides the best means to estimate the real shape and size of the "hippo".

6. Other sources of data

In certain areas, hospital and other laboratories may draw from the data describing volume and varieties of analytical work carried, some information describing the most frequently encountered poisonings and the subjects affected.

Company pay records and employment ledgers may, at times, prove to be valid sources of data to ascertain employment and exposure status. Trade unions membership registers may also provide data of similar nature and validity.

Records of products in use and of registered users may provide valid indications about the nature of products and exposures, and of those at risk of poisoning.

B - POSSIBLE STRATEGIES

1. Introduction

The choice of a strategy is determined by the goal of the study and practical constraints. Even when the nosetip of the "hippo" is sufficiently well known, such as when the most frequent poisons and victims are known, it may be necessary to conduct a population survey when the total shape of the "hippo" is needed. On the other hand, evaluating the results of a control intervention would demand a study of those poisonings the intervention is addressing, in those populations where it is deployed.

The proper consideration of all possible strategies available for the study of poisoning is a delicate and complicated endeavor. To simplify this task, most critical components have been gathered in Figures 4, 5 and 6. Each figure is made of one vertical axis from which branch out horizontal axes, each representing a possible study strategy on its own. The vertical axis represents the prefered course of action while horizontal axes are alternate choices. Axes are made of boxes and diamonds, the latter representing loci where a choice of strategy is to be made. The choices are mutually exclusive. Progress in the charts goes from the starting point to the end of the appropriate axis.

2. Assessing the frequency of fatal cases of poisoning

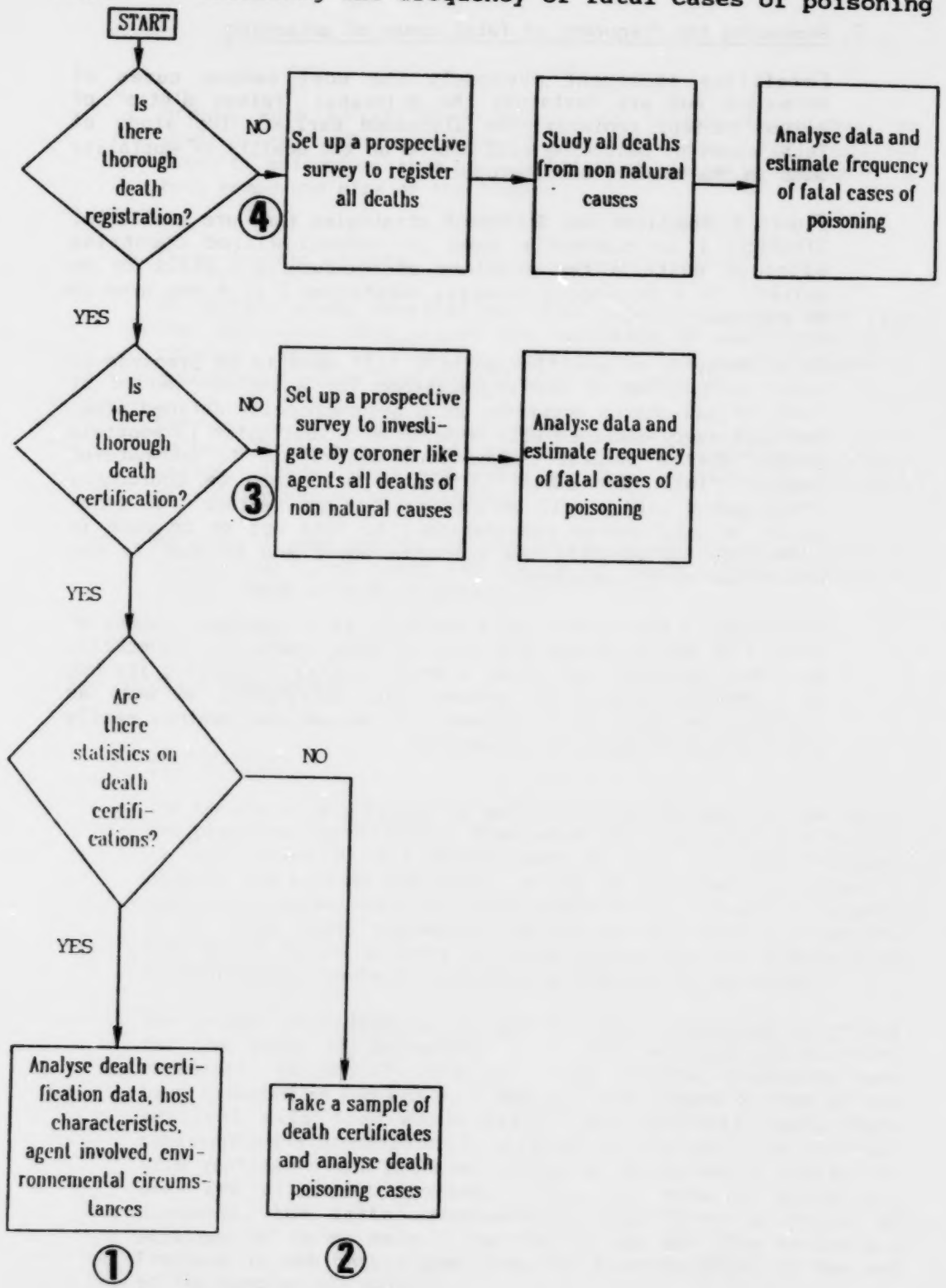
Fatalities represent obviously the most severe cases of poisoning and are certainly the principal "raison d'être" of poison control centers. As discussed earlier, the study of fatal cases of poisoning will depend on the quality of mortality data in the country under study.

Figure 4 describes the different strategies that are available. Strategy 1 is currently used in industrialized countries although quite a few problems of accuracy are still to be solved. In a developing country, strategies 3 or 4 may have to be adopted.

In strategy 4, a specific protocol will have to be prepared in order to systematize the registration for a certain period of time, of all deaths occurring in a geographically defined area. Each and every deceased will have to be investigated to separate deaths due to natural causes from deaths due to non-natural causes. This last subset of deaths will then be thoroughly investigated with a well defined methodology (either thru laboratory or post-mortem examinations) to rule out or to rule in poisoning, to identify the probable agent and to specify the environmental circumstances.

Strategies 3 and 4 call for a capacity to investigate causes of death that may be beyond the reach of many countries, especially when such analysis must cover a whole country. Limiting its use to a smaller area could address this difficulty, as well as limiting the study to those cases of non-natural deaths, easily attributable to specific poisonings.

Figure 4: Assessing the frequency of fatal cases of poisoning


START
Is there thorough death registration?
NO
4
Set up a prospective survey to register all deaths
Study all deaths from non natural causes
Analyse data and estimate frequency of fatal cases of poisoning
YES
Is there thorough death certification?
NO
3
Set up a prospective survey to investigate by coroner like agents all deaths of non natural causes
Analyse data and estimate frequency of fatal cases of poisoning
YES
Are there statistics on death certifications?
NO
YES
Analyse death certification data, host characteristics, agent involved, environemental circumstances
1
Take a sample of death certificates and analyse death poisoning cases
2

3. Assessing the incidence of acute poisoning with moderate or major effects

The study of fatalities will have to be supported by a study of severe cases of acute poisoning vg. poisonings with moderate or major effects.

Figure 5 schematizes all possible choices that are available to the investigator. When medical records are properly kept and hospital services are readily available to all, the study of all hospital cases of poisoning or of a representative sample of these will be sufficient to estimate with acceptable accuracy the true frequency of this type of poisoning (Fig. 5: strategies 1 or 2). If access to hospital is inadequate, then cases will have to be searched for in a study of ambulatory care (strategy 5). Access to ambulatory care has, of course, to be acceptable, or will require improvement during the study period. Hospital utilization data will be studied simultaneously. If standardization of diagnosis and medical record is in need of improvement, a prospective study must be used to improve the quality of these data (strategy 4).

When it is impossible to account for fatalities occurring outside of hospitals, interpretation of mortality data and case fatality ratios will become impossible. On the other hand, estimations of the incidence of acute poisonings with major effects will not be invalidated, because of the relative rarity of death among victims of poisoning. For the more virulent toxics, where death occurs frequently and outside hospitals, the under estimation of severe cases is obvious. Trends of rates of poisoning are determined by access to hospitals and diagnostic skills. This cannot be controlled for over time and may lead to problems in the interpretation of trends.

4. Assessing the incidence of acute poisoning cases with major, moderate or minor effects

The study of all types of poisoning eliciting any kind of clinical signs requires information that will not be provided by studies of fatalities or other major episodes of poisoning. Assessing the incidence of poisoning as defined here calls for a third set of study strategies whose critical features are schematized on figure 6. Since, ambulatory care settings become the major source of data, accessibility to these services must be taken into account and solutions be adopted to problems of access. Figure 6 provides only one strategy since the only workable strategy is prospective and based on a sample of ambulatory care settings in which incident cases of poisoning will be sought with particular attention. Defining a comprehensive frame of all legitimate primary care settings is a prerequisite and commands a thorough understanding of health services utilization patterns within the communities where

poisoning will be studied. This might prove to be a demanding task.

The use of ambulatory services data may be limited by the proportion of cases treated without any record keeping and by the maintenance of highly standardized methods of data collection.

Figure 5: ASSESSING THE INCIDENCE OF POISONING WITH MODERATE OR MAJOR EFFECTS

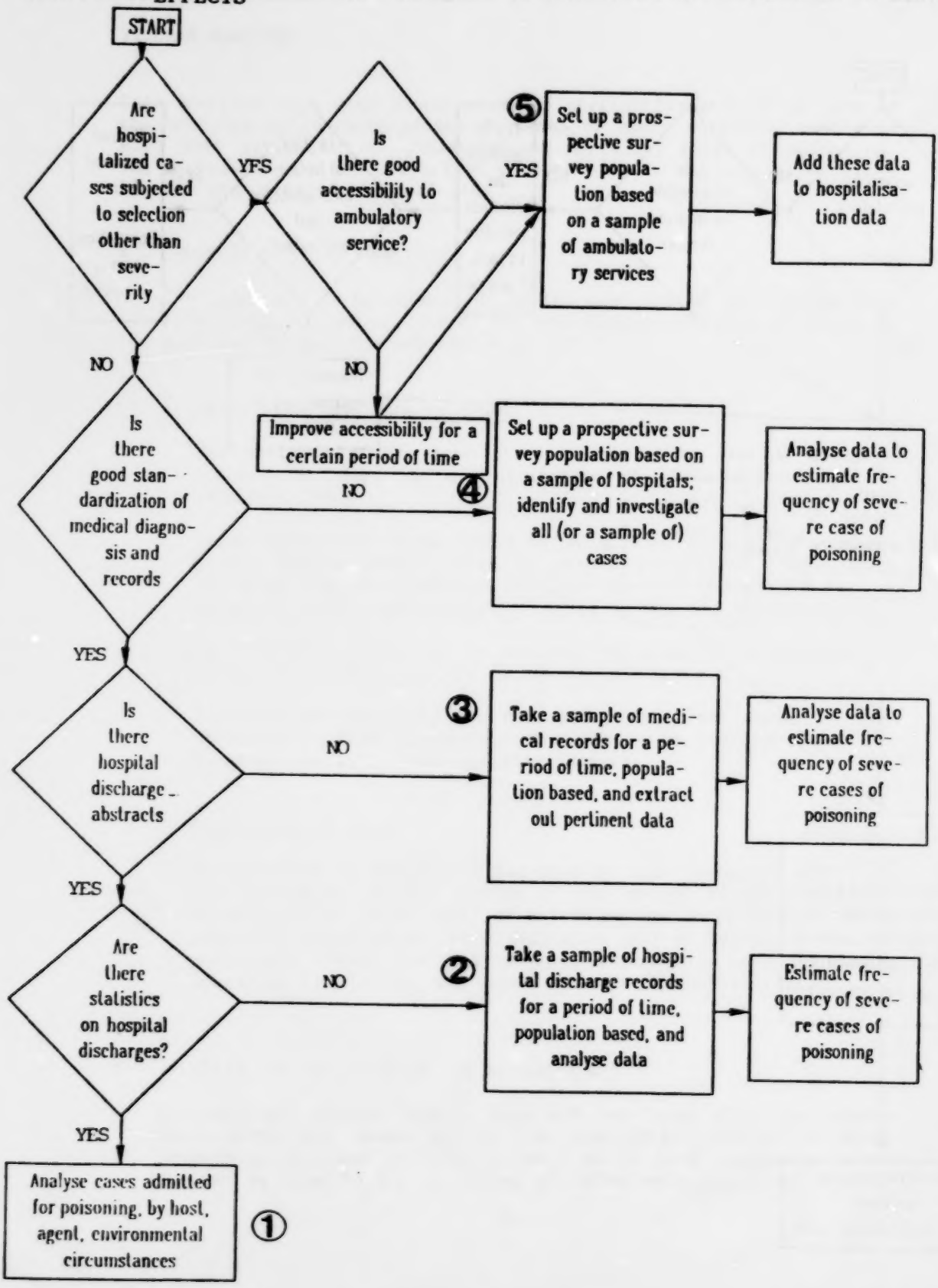
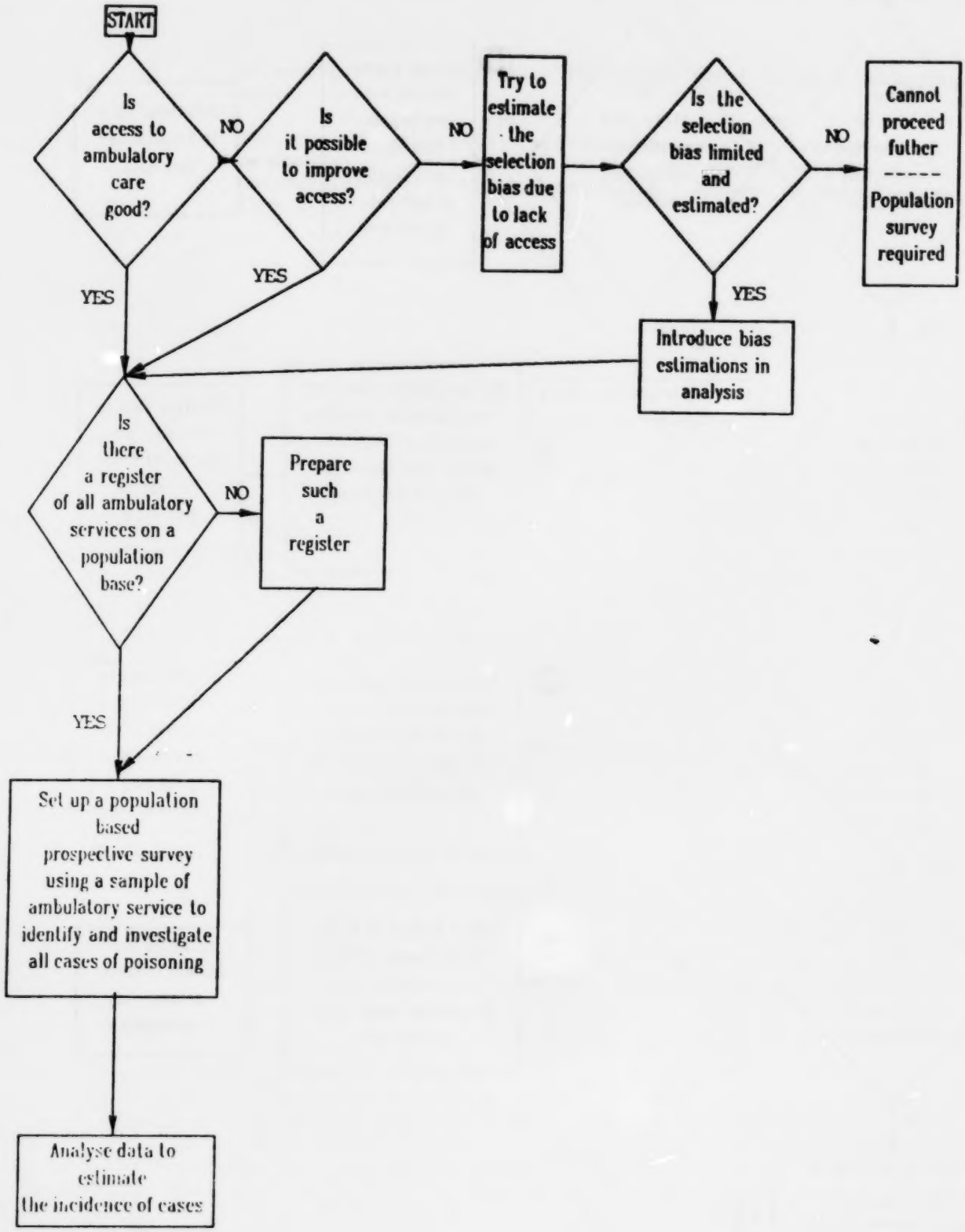

START
Are hospitalized cases subjected to selection other than severity
YES
Is there good accessibility to ambulatory service?
YES
5
Set up a prospective survey population based on a sample of ambulatory services
Add these data to hospitalisation data
NO
NO
Improve accessibility for a certain period of time
Is there good standardization of medical diagnosis and records
NO
4
Set up a prospective survey population based on a sample of hospitals; identify and investigate all (or a sample of) cases
Analyse data to estimate frequency of severe case of poisoning
YES
Is there hospital discharge abstracts
NO
3
Take a sample of medical records for a period of time, population based, and extract out pertinent data
Analyse data to estimate frequency of severe cases of poisoning
YES
Are there statistics on hospital discharges?
NO
2
Take a sample of hospital discharge records for a period of time, population based, and analyse data
Estimate frequency of severe cases of poisoning
YES
Analyse cases admitted for poisoning, by host, agent, environmental circumstances
1

Figure 6: ASSESSING THE INCIDENCE OF CASES OF POISONING WITH MINOR EFFECTS


START
Is access to ambulatory care good?
NO
Is it possible to improve access?
NO
Try to estimate the selection bias due to lack of access
Is the selection bias limited and estimated?
NO
Cannot proceed futher
Population survey required
YES
YES
YES
Introduce bias estimations in analysis
Is there a register of all ambulatory services on a population base?
NO
Prepare such a register
YES
Set up a population based prospective survey using a sample of ambulatory service to identify and investigate all cases of poisoning
Analyse data to estimate the incidence of cases

VI DATA ANALYSIS

Data analysis in a descriptive study is straightforward: it is made of the analysis of characteristics of cases of acute poisoning completed with some estimation of incidence and mortality rates of poisoning. The assessment and the discussion of the validity and precision of the results are parts of the analysis.

A - COMPONENTS OF THE ANALYSIS

Two steps are to be considered in the analysis of descriptive data from acute poisoning. First the descriptive analysis of cases as such and second, the estimation of rates.

1. Descriptive analysis of cases

The analysis of incident cases is useful to provide absolute numbers of cases and a distribution of their characteristics (WISEMAN, 1987).

Crude numbers of cases could be stratified by age, sex, residence, socio-economic level or ethnic groupings. Substances involved and environmental circumstances of poisoning may be described with crude numbers of cases by age and sex groupings.

Case fatality ratios may be computed for specific substances (or groups of substances), and by age and sex groups.

To calculate Proportionate Mortality Ratio, one needs to know total deaths from all causes. The PMR may be calculated for the total population or age-specific subsets.

2. Estimation of rates

By referring to the population-time at risk (usually: number of the population at the middle of the period of observation), estimations of crude rates of poisoning may be obtained. It is possible to estimate crude incidence and mortality rates of poisoning cases for the general population and subgroups specified by age, sex and other relevant characteristics.

B - VALIDITY AND PRECISION OF THE MEASUREMENTS

Epidemiologic studies have to cope with two types of errors: systematic error and random error. In descriptive studies of acute poisoning, problems of validity may result from systematic error induced by bias in the selection of cases rendering them unrepre-

sentative or bias in the diagnosis of poisoning. Random error is due to sampling variation and may elicit problems of precision. Both errors must be taken into account when planning the study and again in the analysis of the data.

1. Validity and precision at the planning stage

Bias in the selection of cases must be minimized. This may be done by optimizing the representativety of the study sample of cases. In the planning stage of sampling, one must work with a list containing all the sampling units from which will be drawn a probability sample, each sampling unit having the same probability to be selected into the sample. The sampling units must be population-based with geographically defined boundaries: an administrative area for deaths or some other form of territorial segmentation for use of medical services. In these two examples, estimates of the size of the population at risk living in the area or at risk of using health services must be available.

Bias in the diagnosis of cases may be minimized by adequate standardization of those collecting the data and by a well defined protocol for the diagnosis of cases.

Concerns about precision will have to be born in mind when planning the study. Once sampling units have been defined, the size of the sampling fraction will be determined, depending on the level of precision needed. The size of the sample of people may be easily defined when some broad estimation of incidence or mortality rates is available. The following formula is to be used to calculate sample size n needed:

$$n = \frac{Z^2 t}{E^2}$$ (BERNARD, 1987)

where Z is 1.96 for a 95% confidence level, t the estimation of the poisoning rate and E the degree of precision sought. Studies of hospital patients are constrained by the fact that subjects under observation have not been selected on a residential basis, but on some other principle which is rarely if ever known to the analyst: it may be access to hospital, personal fortune, or attending physician's preference, etc. Studying at the same time, all patients of all hospitals of a country, would reduce the effects of such selection criteria. This may prove to be impractical and costly. A solution to this problem might be to study all patients of all hospitals of an easily defined region of a country, or to study all patients attending a representative sample of hospitals.

Exposure to toxics may vary substantially with seasons. Agricultural pesticides for instance may be used at specific stages of the growing cycle. Such seasonal variability has to be taken into consideration when planning for sampling.

2. Validity and precision in the analysis

Before computing confidence intervals, one has to probe the validity of the data. In other words, a broad estimation of possible selection and diagnosis bias is required for the analysis and interpretation of both numbers and cases.

The precision of estimates of the rates may be easily computed with this formula: for confidence interval:

$$t \pm Z \frac{t}{\sqrt{a}}$$ (BERNARD, 1987)

where Z is 1.96 for a 95% confidence interval, t is the estimation of the rate and a is the number of sampled cases.

PART 2: SPECIFIC GUIDELINES FOR THE PREPARATION OF A PROTOCOL TO ASSESS THE INCIDENCE OF ACUTE POISONING FROM HOSPITAL DATA

These guidelines have been prepared to help in the design of studies of acute poisoning incidence from hospital data, using a prospective strategy to collect the necessary information. It is therefore granted that other types of epidemiological approches have, for the time being, been discarded because of problems of validity of data as in retrospective studies based on hospital data or problems of implementation as in mortality studies. It is also assumed that selective access to hospital may call for a concomitant study of ambulatory services as mentioned on page 21.

I OBJECTIVES OF THE STUDY

To begin with, the **purpose of the study** has to be carefully stated so as to describe precisely what the researchers have in mind. One practical way of achieving this is to specify what uses will be made of the results of the study, since varied utilization of those results will bear substantial influence on the shape and colors of other steps of the protocol. If for instance, the goal of the study is to assess whether acute poisoning is an important health problem, the study of all possible varieties of poisoning, with special emphasis on the more severe, will have to be carried out. Such a study will have to consider the whole country, or most of the population and all of the high risk groups. If, on the other hand, the goal is to gather a baseline set of data against which the effect of an intervention such as a poison control program (PCP) will eventually be assessed, the researcher will focus on the catchment areas set for the P.C.P. and examine the outcomes of specified varieties of poisoning, chosen among those that are sensitive to a P.C.P. The importance of the clarity of purpose cannot be overstated. Once it is completed, the definition of objectives is made much easier.

The **general objective** will specify what is under study and determine the time and space boundaries of the study. The following are also essential components of the general objective:

a) nature of agents or exposure;

b) environmental circumstances;

c) severity of poisonings under study: will all cases admitted to hospitals be studied, or only the subset of those admitted for a preset minimum length-of-stay? Are other criteria of severity to be used?;

d) target population: for what population are the results to be generalized? This group should be defined by certain socio-demographic characteristics: v.g. age, sex, residency, occupation, etc.;

e) length of time: the duration of the study must be defined. If poisoning is subjected to substantial seasonal variations, the length of time will have to be sufficient to accomodate such variations.

An example of such a general objective could be: to determine, over a one year period, the incidence of acute poisoning by household products among children aged 5 and less, living in the area of "alpha-village" and for which hospital treatment was required for a period longer than 24 hours.

II STUDY POPULATION

Defining the population under study is no meagre task when working with hospital data. The problem is made simple when there is only one single institution serving a given population, such as may often be observed in rural areas. In those circumstances, the total inhabitants of the region make the population under study, since the boundaries of the catchment area of the hospital may be deemed to coincide with the geographical boundaries of the area. Even under these circumstances, it remains possible that groups of the population may bypass that single hospital and try to seek care elsewhere, when needed, by reason of some other selection criteria such as ethnicity, religion, severity of illness, etc. Once these selection criteria have been checked out and found to be irrelevant, it is possible to define the catchment area of the hospital, by plotting, from retrospective data, the area where patients have been drawn from, in the recent past. It then becomes possible to compute a fairly stable average distance which will become the radius of the catchment area of the hospital.

In urban areas where many hospitals may be found within a short range of each other, this method is impractical. The only way out of this problem is to consider the whole urban population as belonging to one single catchment area shared by all hospitals. All hospitals should then be included in the study and all their data pooled as if they made one single institution with multiple physical plants. The subset of the total population that can be assigned as the catchment area of a given hospital, may be computed with the Relevance Index* (DEVER, 1980). The Relevance Index provides acceptable estimate of the catchment area. The size and major characteristics of that population will have to be estimated or derived from census data. Stratification of the population on sex, age, occupations is essential if rates of poisoning are to be estimated for specific subgroups of the population.

$$\text{* Relevance Index for Hospital A} = \frac{\text{Admission from the study region to Hospital A}}{\text{Total admission for poisoning to all hospitals from the study region}} \times 100$$

III SAMPLING METHODS

There are two major sampling strategies according to the nature of sampling units. When regions are clearly defined and self-sufficient with respect to health services, regions may be used as sampling units. Stratification for exposure may be used when levels of exposure vary between regions. Volumes of agricultural production as an index of the relative importance of that industry may be used to stratify different regions of a country.

In countries with important urban areas, hospitals will have to be used as sampling units. All the hospitals located within the area under study will be entered into a register. These hospitals will have to be classified by those characteristics that could influence the catchment population: location, varieties of medical services, proprietary status, etc. Sample sizes will have to be computed with the formula on p. 26 if the catment population of each hospital is not homogeneous. For these computations, some crude estimates of the incidence of poisoning are prerequisites as well as levels of precision that are required. Once the sample size is defined, and when hospitals are the sampling units, some estimates of the catchment population/area will be needed to set the sampling fraction or the number of hospitals to be studied. Usually a sampling fraction will be proportionnal to the size of the catment population. Practical constraints may also bear considerably on the determination of sample size.

IV DEFINITION OF CASES

Each type of poisoning has to be clearly described for cases to be identified with acceptable uniformity. The International Programme on Chemical Safety (I.P.C.S.) is currently working on standardized definitions for each type of poisoning reported by poison control centers. This work will enable poison control centers to collect and report standardized data, making thus possible, international comparisons. When completed, this work will prove to be immensely useful for the conduct of epidemiological research on acute poisoning, even if it may not apply everywhere because of shortages in trained personnel or limited availability of laboratory facilities. Solutions to these problems will have to be found in each country.

In practice, definition of a case should contain, as a minimum, one of the four sets of elements that follow:

1) definite history of exposure plus clinically relevant signs and symptoms;

2) history of exposure plus clinically relevant signs and symptoms plus evolution;

3) clinically relevant signs and symptoms plus relevant laboratory or other clinical investigation;

4) clinically relevant signs and symptoms plus response to treatment.

The definition that will be adopted will depend on the "state of the art" in the scientific literature and on local conditions of the country where the study is carried out. It seems advisable that, for the purpose of the study, the definite diagnosis be confirmed by the research staff. Health professionals attending poisoned patients will

collect data about the history, clinical signs, laboratory investigation, evolution and response to treatment. These data could be recorded on a modified version of the IPCS Record sheet (Appendix 3, items 11-16).

Data about treatment itself will be kept to the minimum that is necessary for diagnosis validation purposes, but may become more substantial if improvements in treatment that follow the opening of a poison control center for instance, are to be verified.

While health professionals providing care to patients will have to fill this form each time they attend a case of probable acute poisoning, definitive diagnosis will be decided by the research staff with those criteria chosen for cases definition. Once defined, cases have to be classified for severity and the classification published by the American Poison Centers Association (Appendix 1) or that to be developed by IPCS may be useful.

V VARIABLES OF INTEREST

The collection of data on the patient (host), poisons (agents) and the environmental circumstances of poisoning may be done with a modified version of the IPCS Record sheet. The following variables are considered to be of prime interest.

1) Host variables (IPCS sheet, item 6): name, age, sex, occupation, residency, occupation of both parents (when child), ethnicity, marital status and educational level are the most essential host variables to be considered.

2) Agent variables (IPCS sheet, items 7 and 10): a description of the agent in terms of generic or trade names is necessary as well as quantities, frequency, duration and route of exposure. Each agent will then be classified by the research staff using instruments such as the WHO ICDA-9 or the one being prepared by IPCS. Local adaptations are possible as illustrated by the classification used by Canadian Poison Control Centers (Appendix 2).

3) Environmental circumstances (IPCS sheet, items 8 and 9): sites or locations where poisoning occurred must be reported and item 8 of the data sheet provides a handy systematisation of sites. Circumstances of poisoning must also be defined and reported and the classification prepared by the American Association of Poison Control Centers (p. 9) is well adapted for this purpose. A residual category, labelled "others" may be added to each of the many available classes of poisoning.

VI METHODS OF DATA COLLECTION

Three stages of the study are immediately concerned with methods of data collection: the recognition and recruiting of cases, the gathering of relevant data and the validation of cases.

1) The capacity to recognize cases can be improved by specific training aimed at health personnel attending patients in the emergency room and on the wards.

2) Recording of information on data sheets may be done by the medical officers in charge of patient care. These physicians will need training and coaching to maintain thoroughness of reporting.

3) The validation of cases reported will be done on each site, by the research staff when collecting data sheets. Once data sheets have been verified and validated by these enumerators, some cases will require checking with attending clinical staff, or the patient to collect missing data. The validity of information recorded on the data sheets will be systematically checked against clinical records. Finally, enumerators will make sure that double counting of cases does not occur because of intra-hospital or inter-hospital circulation of the same persons.

VII DATA COLLECTION INSTRUMENTS

A modified version of the IPCS data sheet will be prepared and field tested. Problems encountered in filling the data sheet will be solved through proper modifications. The validity of the diagnosis of poisoning is a critical issue in such a study. The following items are required to ensure acceptable validity:

1) The criteria of diagnosis, as defined by experts, must be usable with good validity, in the country where they will be put to use. When possible, such criteria should also be field tested against some form of standards such as a laboratory diagnosis or the clinical assessment of a toxicologist.

2) Since the definite diagnosis of each case will be ascertained by enumerators of the research staff working from the data sheets, the reliability of case ascertainment will require verification against definition criteria.

VIII DATA ANALYSIS

The data should be collected as requested by the data sheets and not transformed or grouped at the time of collection. The transfer of primary data from the recorded sheet to computer data sets should be done by a clerical officer who has been trained for this task. Where possible, all the primary data should be integrated to the data sets without any coding, to avoid risks of misclassification occurring at this early stage. IPCS has developed software to perform this task.

All data entered in the computerized data set should be anonymous, and identified by code numbers that would permit the research staff to return, if need be, to the personalized clinical records. All data need to be personalized, to verify validity, double counting, etc. But an efficient separation of identities and data sets is provided by proper encoding. Cleaning data bases is a necessary pre requisite to the preparation of tables and other displays of the data. But before getting into tables it is important to proceed to one last review of the validity issues.

Problems of validity may arise from:

1) defective ascertainment of cases;

2) possible misclassification of cases by diagnosis;

3) underestimation through loss of cases because of selective accessibility to hospitals;

4) loss of collected data within the participating hospitals.

The computation of rates has to deal with the additional burden of verifying the validity of the definition of the population at risk. Mortality data will be handled with caution because of the substantial numbers of fatalities occurring outside of hospitals. In this type of study, mortality rates or case fatality ratio need not be used to assess the severity of a given agent for certain age-groups. Incidence rates are the most frequently used measures, because of their utility in comparisons. The following incidence rates may be computed:

- crude incidence rate;

- incidence rate by age;
  by sex;
  by residence;
  by ethnicity;
  by time, of the day, of the week, of the month;
  by location of incident;
  by agent;
  by environmental circumstances.

When numbers of cases are of sufficient size, the stratification of incidence rates becomes possible for combinations of variables such as:

- incidence rate by agent, by age and sex;

- incidence rate by circumstance, by age and sex.

The precision of the rates will be described with 95% confidence intervals as computed with the formula on p. 27, when patients are not homogeneous within each catchment population and the statistical significance of regional variations may be assessed with these confidence intervals. Since issues related to statistical validity have been settled when the study was at the planning stage, the power of the statistical test should be kept in mind when drawing inferences from the findings.

IX PRACTICAL CONSIDERATIONS

The realization of the epidemiological study is to be programmed in 4 phases:

- the preparation of operations;

- the pilot study;

- the principal or definite study;

- the analysis and the writing of the report.

Each phase has its own time and resources requirements.

In the **preparatory phase**, the following actions will be engaged:

1) Organization of an operation committee. The membership will be made of the project coordinator, one toxicologist, one statistician, one epidemiologist and one research assistant. This committee will be in charge of the planning and of the preparation of the detailed protocol, including the design of data collection forms and procedures when needed.

   The training of enumerators, the setting of standing orders and procedures for data collection and control within participating hospitals, the verification and storage of data will be assumed by the operations committee. The final diagnostic ascertainment of each case will be undertaken by members of this committee.

2) Organization of a steering committee. The membership should include all members able to contribute to its task which is to provide political support for the study, elicit cooperation among health personnel and facilities and gather the necessary funding.

3) Organization of an expert committee in clinical toxicology whose task will be to provide operational definitions of cases for each type of poisoning under study. In cooperation with the operations committee, the expert committee will prepare first drafts of data collection sheets and the content of training sessions addressed to clinicians appointed to the function of diagnosis.

In the **pilot study phase**, participants to the study will familiarize themselves with the varied operational procedures of the study. The training of participants is done in this phase as all the required authorizations are gathered to gain proper access to restricted data and the information needed for the definition of the population at risk. In this phase, feasibility of the study must be clearly assessed and modifications of the protocol might become necessary.

The **definitive study** will not begin until everything has been proven ready and feasible. Some form of feedback to all those participating in the collection of data is mandatory to maintain motivation and the level of skills attained in the training session.

The **analysis and report writing phase** begins when the time frame set for the study has expired and all the collected data have been assembled. While data record sheets will have been continuously transferred to computer tapes or records, once verified and found valid, it is unusual to carry any analysis before the end of data collection, unless the expert or steering or operations committee had some special request for an interim analysis. While the transfer of data from the written record to computer data bases will be handled by a clerk, for the analysis a computer technician will be needed in support of the epidemiologist and statistician in charge of the analysis. Once the analysis is completed, the final report should be written up, by the research staff.

The principal readership of this report is made up of the agencies who supported the study. A scientific communication may then be drawn from the report and the main results brought to the attention of the scientific community. Such publications are actively sought by periodicals such as the WHO Bulletin (Geneva), Human Toxicology (England), Veterinary and Human Toxicology (U.S.A.).

For every phase, detailed schedules, critical paths and listings of tasks should be prepared. Inventory of resources needed and their projected costs will be on hand:

- salaries and compensation for participating health personnel, consultants and research staff;
- travelling and subsistence costs for enumerators and control staff;
- equipment and supplies, including rentals;
- stationery and printing costs: case listings, record data sheets, questionnaires, training manuals, standing orders and procedures;
- communications: telephone, mail, courrier services;
- laboratory services when they are required for quality or validity control purposes;
- maintenance services;
- cost incurred in the training of personnel;
- costs involved in the dissemination of results.

CONCLUSION

The first section of this paper has reviewed briefly the issues most frequently related to the assessment of the incidence of acute poisoning with a population based perspective. Alternative strategies have been sketched to address specific sets of constraints and overcome the most important obstacles. The purpose of this section is to assist: 1) in the identification of those epidemiological studies that are possible in developing countries; 2) in the definitions of the types of information that are required to conduct a valid epidemiological study; 3) in the selection of the variety(ies) of poisoning that should be studied in developing countries; 4) in the preparation of a protocol that would help in reaching these goals.

The second section has presented, with some details, elements of a protocole designed to assess the incidence of acute poisoning from hospital data in developing countries. Even if them are more specific, these last guidelines will have to be adapted taking into account the needs of each country and their local conditions.

REFERENCES

ANDERSON, D.W., MANTEL, N. (1983). "On epidemiologic surveys". **Am. J Epid, 118: 613-619.**

BAKER, J. et all. (1978). "Epidemic malathion poisoning in Pakistan malaria workers". **The Lancet, 31-34.**

BUSIK, S.C., HINDMARSH, K.W. (1986). "Poisoning: incidence and knowledge in Saskatchewan". **Vet Hum Toxicol, 28: 421-423.**

BERNARD, P.M., LAPOINTE, C. (1987). **Mesures statistiques en épidémiologie, Presses de l'Université du Québec.**

CHRISTEN, H.J., ZINK, C., ZINC, A., KORPORAL, J. (1981). "Accidental poisoning in childhood from the epidemiological viewpoint". **Vet Hum Toxicol, 23: 321-327.**

DEVER, G.E.A. (1980). Community health analysis. **Aspen Syst. Corp.,** London, England.

ELLENHORN, M.J., BARCELOUX, D.G. (1987). **Medical Toxicology.** Elsevier, New York.

FAHIM, B.A., EL-SEMARY, L.M. (1983). "Short-term experience of the newly established poison control centre of Cairo", **Hum Toxicol, 2:** 327-34.

FDA (1984). "Poisoning mortality in the United States 1980". **Vet Hum Toxicol, 26: 273-275.**

GALLAGHER, S.S., FINISON, K., GUYER, B., GOODENOUGH, S. (1984). "The incidence of injuries among 87 000 Massachusetts children and adolescents: Results of the 1980-81 statewide childhood injury prevention program surveillance system". **Am J Publ. Health, 74:** 1340-1347.

GARRIOT, J.C., DIMAIO, V.J.M., PETTY, C.S. (1982). "Death by poisoning: a ten year survey of Dallas county". **Journal of Forensic Sciences, 27: 868-879.**

GOULDING, R. (1987). "Interpretation of data collected in poison centres". **Vet Hum Toxicol, 29: 442-444.**

GUYER, B., GALLAGHER, S.S. (1985). "An approach to the epidemiology of chilhood injuries". **Ped. Clin, North Am., 32: 5-15.**

JACOBSEN, D., FREDERICHSEN, P.S., SORUM, Y., TALSETH, T., ODDEGAARD, O.R. (1984). "A prospective study of 1212 cases of acute poisoning: general epidemiology". **Human Toxicol, 3: 93-106.**

JEYARATNAM, J., DE ALWIS SENEMIRATNE, R.S., COPPLESTONE, J.F. (1982). "Survey of pesticide poisoning in Sri Lanka". Bull. W H O, 60: 614-619.

JEYARATNAM, J. (1985). "1984 and occupational health in developing countries". Scand J Work Environ Health, 11: 229-234.

JEYARATNAM, J., LUN, K.C., PHOON, W.O. (1987). "Survey of acute pesticide poisoning among agricultural workers in four asian countries". Bull W H O, 65: 521-27.

JOUBERT, P., SEBATA, B. (1982). "The role of prospective epidemiology in the establishment of a toxicology service for a developing community". S.A. Mediese Tyaskrif, 62: 853-854.

HEPLER, B.R., SUTHEIMER, C.A., SUNSHINE, T. (1986). "Role of the toxicology laboratory in the treatment of acute poisoning". Medical Toxicology, 1: 61-75.

HWC (1985). Poison Control Statistics. Health and Welfare Canada.

KLAASSEN, C.D., ANDUR, M.O., DOULL, J. (1986). Casarett and Doull's Toxicology, MacMillan, N.Y.

KLAUBER, M.R., BARRETT-CONNOR, E., HOFSTETTER, C.R., MICIK,, S.H. (1986). " A population-based study of non fatal chilhood injuries". Prev. Medicine, 15: 139-149.

LITOVITZ, T.L., MARTIN, T.G., SCHMITZ, B. (1987). "Annual report of the American Association Poison Control Centers National data collection system". Emergency Medecine, 5: 405-435.

MASI, A.T., (1965). "Potential uses and limitations of hospital data in epidemiologic research". Am J Publ Health, 55: 658-667.

MAUSNER, J.S., KRAMER, S. (1985). Mausner and Bahn, Epidemiology - A introductory text. W B Saunders, Philadelphia.

MMWR (1985). "Update, childhood poisonings - United States". MMWR, vol. 34, no 9: 117-118.

NORTON, L.E., GARRIOT, J.G., DI MAIO, V.M. (1982). "Drug detection at autopsy: a prospective study of 247 cases". Journal of Forensic Sciences, 27: 66-71.

OLSON, D.K., KINGSTON, R., HALL, S., WHITE, M.S. (1985). "An epidemiological view of poisoning". Vet Hum Toxicol, 27: 402-408.

OLSON, K.R., PENTEL, P.R., KELLEY, M.T. (1987). "Physical assessment and differential diagnosis of the poisoned patient". Medical Toxicology, 2: 52-81.

PHOON, W.O. (1985). **Epidemiology for the health officer: a field manual for the tropics.** World Health Organisation, Geneva.

PROUDFOOT, A.T. (1982). **Diagnosis and management of acute poisoning.** Blackwell scientific Publications, Oxford.

RANDOM HOUSE DICTIONNARY of the English language (1909). The Tulsi Shah Entreprises. Bombay.

SENEWIRATNE, B., THAMBIPILLAI, S. (1974). "Pattern of poisoning in a developing agricultural country". **Brit. J. prev. soc. Med.**, 28: 32-36.

SIRKEN, M.G., ROSENBERG, H.M., CHEVARLEY, F.M., CURTIN, L.R. (1987). "The quality of cause-of-death statistics". **Am J Publ Health 1987,** 77: 137-139.

TRINKOFF, A.M., BAKER, S.P. (1986). "Poisoning hospitalisations and deaths from solids and liquids among children and teenagers". **Am J Publ Health,** 76: 657-660.

UNITED NATIONS (1984). **Data bases for mortality measurement.** Population studies, no 84, United Nations, New York.

VALE, J.A. (1977). "The epidemiology of acute poisoning". **Acta Pharmacologica and Toxicologica,** vol. 41, no 12: 443-458.

VALE, J.A., MEREDITH, T.J. (1981). "Epidemiology of Poisoning". **Poisoning diagnosis and treatment,** ch I: 1-8. J.A. Vale and T.J. Meredith Ed., Update Books, London.

VELTRI, J.C. (1982). "Regional poison control services". **Hospital Formulary,** vol. 17: 1469-1482.

VELTRI, J.C., Mc ELWEE, N.E., SCHUMACHER, M.C. (1987). "Interpretation and uses of data collected in poison control centres in the United States". **Medical Toxicology,** 2: 389-397.

WISEMAN, H.M., GUEST, K., MURRAY, S.G., VOLANS, G.N. (1987). "Accidental Poisoning in childhood: a multicentre survey: 1. General Epidemiology, **Hum Toxicol,** 6: 293-301.

WEISS, B., CLARKSON, T.W. (1986). "Toxic chemical disasters and the implications of Bhopal for technology transfer". **The Milbank Quarterly,** 64: 216-240.

WIDDOP, B. (1981). "The diagnosis of poisonings: use of the laboratory". **Poisoning diagnosis and treatment,** ch 3: 13-25. J.A. Vale and T.J. Meredith Ed., Update Books, London.

WORLD HEALTH ORGANIZATION (1977). **International classification of diseases,** Ninth Revision, Geneva.

APPENDICES

Appendix I : Classification of medical outcomes by severing (American Poison Control Centers Association)

Appendix II: Canadian Poison Control Centers classification of agents

Appendix III: International Programme on Chemical Safety data sheet

Appendix I

Classification of medical outcomes by severity

No effect — The patient developed no symptoms as a result of the exposure.

Minor effect — The patient exhibited some symptoms as a result of the exposure but those symptoms were not life-treatening. The symptoms resolved rapidly, usually involved skin or mucous membrane manifestations and the patient has returned to a pre-exposure state of well-being without residual disability or disfigurement. Some examples are mild gastrointestinal symptoms, drowsiness, skin irritation or first degree burn.

Moderate effect — The patient exhibited symptoms as a result of the exposure which were more pronounced, more prolonged or more of a systemic nature than minor symptoms usually somme form of treatment is or would have been indicated to treat the patient. Symptoms were not life-treatening and the patient has returned to a pre-exposure state of well-being with no residual disability or disfigurement. Some example are: a corneal abrasion, acid-base disturbance, high fever, disorientation, hypotension which rapidly responded to treatment, and isolated brief seizures which resolved spontaneously or readily responded to treatment.

Major effect — The patient has exibited some symptoms as a result of the exposure. the symptoms were life-threatening or resulted in residual disability or disfigurement.

Unknown, non-toxic exposure — The patient was lost to follow-up. However, in your estimation the exposure was likely to be non-toxic because the agent involved was non-toxic or the amount of the exposure was insignifiant and unlikely to result in toxicity.

Unknown potentialy toxic — The patient was lost to follow-up and in our estimation, the exposure was significant and may resulted in toxic manifestations.

Unrelated effect	The patient exhibited symptoms which were initially thought to be related to a toxic problem. However, the symptoms were ultimately diagnosed as not related to a toxic problem.
Death	The patient died as a result of the exposure or a direct complication of the exposure which was unlikely to have occured had the toxic exposure not preceded the complication.

APPENDIX 11

CLASSIFICATION

DRUGS/MÉDICAMENTS

INDEX	THERAPEUTIC	THÉRAPEUTIQUE
04	ANTIHISTAMINE DRUGS	ANTIHISTAMINIQUES
08	ANTI-INFECTIVE AGENTS	ANTI-INFECTIEUX
12	AUTONOMIC DRUGS	MÉDICAMENTS DU SNA
20	BLOOD FORMATION AND COAGULATION	AGENTS DE FORMATION DU SANG ET COAGULANT
24	CARDIOVASCULAR DRUGS	AGENTS DU SCV
28	CNS DRUGS	AGENTS DU SNC
48	EXPECTORANTS AND COUGH PREP.	EXPECTORANT ET ANTITUSSIF
52	EYE, EAR, NOSE AND THROAT	OTO-RHINO-LARYNGOLOGIE-OPHTALMIQUES
56	GASTROINTESTINAL DRUGS	SYSTÈME GASTRO-INTESTINAL (AGENTS DU)
68	HORMONES AND SYNTHETIC SUBST.	HORMONE ET SUCCÉDANÉ SYNTHÉTIQUE
84	SKIN AND MUCOUS MEMBRANE	DERMATOLOGIQUE (PRÉP)
88	VITAMINS	VITAMINES
100	OTHER DRUGS	AUTRES MÉDICAMENTS
195	SIRECT DRUGS	DROGUES (STUPÉFIANTS)
490	UNKNOWN DRUGS	MÉDICAMENTS INCONNUS
495	MULTIPLE DRUGS	MÉDICAMENTS MULTIPLES

SUB-INDEX

	THERAPEUTIC	THÉRAPEUTIQUE
016	PSYCHOTHERAPEUTIC AGENTS	PSYCHOSE (TRAITEMENT DE LA)
024	SEDATIVES AND HYPNOTICS	SÉDATIFS ET HYPNOTIQUES
	INGREDIENTS (Simple and Compound)	**INGRÉDIENT (Simple et composé)**
110	ASA	AAS
120	ACETAMINOPHEN	ACÉTAMINOPHÈNE
130	CAMPHOR PRODUCTS	PRODUITS AVEC CAMPHRE
140	METHYL SALICYLATE	MÉTHYL SALICYLIQUE
150	IRON PREPARATIONS	FER (PRÉP À BASE DE)

NOTES: 1. INDEX: 04 - 84 ... American Hospital Formulary Service Classification System (AHFSCS)

2. SUB-INDEX: 016 ... 28:16
024 ... 28:24 - - - AHFSCS
150 ... 20:04:04

3. "SUB-INDEX": is a part of "Index"/"SUB-INDEX" fait partie DE "INDEX"

NON-DRUGS/NON-MÉDICAMENTS

INDEX	CATEGORY	CATÉGORIE
500	COSMETICS	COSMÉTIQUES
520	PESTICIDES	PESTICIDES
540	FERTILIZERS AND PLANT FOODS	ENGRAIS
560	HOUSEHOLD PRODUCTS	PRODUITS TOUT USAGE
580	PAINT, PATCHING AND BLDG. PRODUCTS	PEINTURES, MASTICS ET PRODUITS DE CONSTRUCTION
600	PETROLEUM HYDROCARBONS	HYDROCARBURES DE PÉTROLE
620	AUTOMOTIVE PRODUCTS	PRODUITS AUTOMOBILES
640	CHEMICALS, GASES AND VAPOURS	PRODUITS CHIMIQUES, GAS ET VAPEURS
660	CRAFTS AND HOBBIES	ARTISANAIS ET PASSE-TEMPS
680	GLUES AND ADHESIVES	COLLES ET ADHÉSIFS
700	TOYS	JOUETS
720	PLANTS	PLANTES
740	SUBSTANCES INGESTED AS "FOOD"	SUBSTANCES PRISES COMME "ALIMENTS"
760	FOOD	ALIMENTS
900	MISCELLANEOUS AND UNKNOWN	DIVERS ET INCONNUS
910	MULTIPLE	MULTIPLE

DRUG AND/OR NON-DRUGS/MÉDICAMENTS ET/OU NON-MÉDICAMENTS

995	MIXED (Drug and non-drug)	MÉLANGE (méd et non-méd)
999	DRUG? NON-DRUG?, Unknown	MÉD? NON-MÉD?, Inconnue

APPENDIX III

DRAFT IPCS RECORD SHEET FOR CASE DATA

1. CENTRE CODE: _____/_____

2. RECORD NUMBER: _____/_____ - Recall
- Multiple

3. DATE: Month _____/Day _____/Time _____

DELAY SINCE EXPOSURE (Estimated): Minutes
Hours
Days
Not known

4. ENQUIRER: Name: _____

Address: _____

_____

Telephone No. _____

4.1 Medical Services

4.1.1 Outside Hospital:
General Practitioner
Occupational Health Service
Nurse
Paramedical
Pharmacist
Veterinary Surgeon

Specialist Physician
General Medicine
Paediatrician
Psychiatrist
Others

4.1.2 Hospital
Emergency Physician
General Medicine
Intensive Care
Paediatrician
Psychiatrist
Other Specialist
Nurse
Pharmacist

4.2 Poison Centre

4.3 Others

General Public: victim
relative/friend etc.

Public Health Authority
Other Governmental Authority
Industry
Emergency Services (fire brigades, police, ambulance)
Mass media
School
Social Services
Other
Unknown

5. TYPE OF ENQUIRY:

Information only - education
- prevention
- antidotes
- other

Emergency
Non-emergency
Recall
Other
Unknown

6. PATIENT:

Human: (or Animal, see later menu)

Name: _____

Address: _____

_____

Telephone No. _____

Multiple cases No. _____ Max. _____ Min. _____

Age: Year _____ Months _____ Days _____

Known
Estimated
Not known

Sex: Male Female

Marital status: Single Married Divorced/Separated

Pregnant: Duration _____ (weeks)

Weight: (Kg)

Known
Estimated
Considered: Overweight Normal Underweight

Unknown

Predisposing factors: - ethnic origin
- prior medical history

Occupation: (of both parents, if a child) _____

Animal: Species _____ No. _____

7. AGENT(S):

Name (given by caller)
Use/description
Manufacturer (if relevant)

True/False
If false, correct Name
Use
Manufacture

Quantity: Volume _____ Weight _____ No. _____

Numerical - Known
- Estimate

Qualitative: Trivial Small Moderate Large Massive

Unknown

Frequency: Single

Repeated: Frequency

Duration: Years Weeks Days Hours Mins

8. LOCATION: Home and surroundings

Workplace

Factory
Workshop
Laboratory
Agriculture/Horticulture
Other

Community

Nursery or primary school
Other school, university, other educational establishment
Hospital, clinic, nursing home
Institution: prison, military, other
Other

Enclosed public places

Shops, cinema, sports centre, other

Open places

Highway, sports ground, parks, other

Unknown

9. CIRCUMSTANCES:

Accidental	Deliberate	Unintentional	Iatrogenic
Acute	Chronic		
Fire	Bite	Sting	Wound

10. ROUTES OF EXPOSURE:

Ingestion
Inhalation
Cutaneous
Eye contact
Parenteral: Subcutaneous
Intramuscular
Intravenous
Intra-arterial
Intra-peritoneal
Other
Mucosal: Buccal
Nasal
Rectal
Vaginal
Penile
Placental
Other

11. SYMPTOMS/SIGNS:

Cardiovascular: Pulse
BP
Failure

Central Nervous System
Cutaneous
Endocrine
Gynaecological
Haematological
Hepatic
Immunological
Metabolic
Neuromuscular
Occular
Oropharynx

Psychiatric
Renal
Respiratory
Other

12. TOXICOLOGICAL ANALYSES:

None
Qualitative (+)
Quantitative body fluid/tissue type result

13. OTHER INVESTIGATIONS:

14. INITIAL EVALUATION (to retain if no follow-up is made)

Non-toxic
Probably non-toxic
Poisoning not excluded
Predictable risk
Established poisoning

15. TREATMENT:

None

15.1 Place of treatment - scene of exposure
- during transport
- pharmacy
- hospital emergency
in-patient
out-patient

Duration in hospital:

15.2 Treatment by - self
- non-medical
- first-aid worker
- paramedic
- nurse
- physician
- other

15.3 Treatment given Inappropriate measures

Life supportive procedures

- adequate airway
- O_2 intake
- ventilation
- blood pressure
fluids
drugs

Prevention of absorption

- gastric emptying
  - emesis
  - gastric aspiration
  - gastric lavage
- activated charcoal
  - single dose
  - repeated oral doses
- cathartic
  - saline
  - sorbitol
  - others
- skin lavage
- eye lavage
- others

Symptomatic treatment and specific treatment

Antidote therapy - menu

Elimination

- renal
- peritonial dialysis
- hemodialysis
- hemoperfusion

Others

16. OUTCOME:

Complete recovery
Sequellae
Death
Unknown

17. FINAL EVALUATION:

No poisoning
Poisoning - without symptoms
- mild
- moderate
- severe

Symptoms for computer assisted assessment of severity

Suggested severe symptoms:

Anuria
Cardiac arrhythmias
Collapse
Coma
Convulsions
Jaundice

Pancytopenia
Respiratory failure

Serious poisoning:	2 symptoms present
Moderate poisoning:	1 symptoms present
Mild poisoning:	other symptoms

GUIDELINES FOR COMPLETING CASE DATA RECORD SHEET

1. **Centre Number:**

Part 1 could be the international telephone code for the country.

Part 2 could be a unique number assigned to the centre, e.g. in Brazil centres 1-18, in Sri Lanka this would be left blank.

2. **Serial Number Assigned by the Centre:**

Prefix with year, e.g. 88/00001. Recall enquiries and those involving multiple cases would be flagged, but no further action is planned on this data until the next review of the pilot project.

(Item 1 and 2 would be essentially automatic computer functions once the year had been set).

3. Date:

This need not include year since it is covered in Serial Record Number.

Estimated Delay Since Exposure. If the actual Time for Exposure is needed, e.g. for epidemiological purposes, it could be calculated by the computer from the time of enquiry minus the estimated delay since exposure.

4. Enquirer:

Name, address and telephone number are needed during management of the case and for follow-up to obtain active data. The address may be abbreviated when related to data that is well known or perhaps available in another file on the computer, e.g. for hospitals. This data must remain confidential to the centre. It must never be available elsewhere on computer, but could be provided to others in certain special circumstances, e.g. for local legal requirements.

A menu list is provided to assist classification, (further definitions may be needed), e.g. non-emergency enquiries by emergency services should still be coded as from that source, for items listed as other/unknown free text entry permitted. Later analysis of this free text could be used to alter the menu.

5. Type of Enquiry:

Information only enquiries should be reviewed at later working group meetings, and if appropriate, a further classification could be introduced.

Emergency/non-emergency enquiries should be classified according to the views of the centre, and not those of the enquirer.

Analysis of the other enquiries could be used later to develop the menu.

6. (a) Human:

First identify human or animal. This will activate different menus. Details of patient identity must remain confidential to the poisons centre. They may be based on the patient's address or the hospital record number according to the circumstances of the case. If the address is the same as for the enquirer this could be entered automatically.

The study of incidents involving multiple cases should be separate and undertaken later in the project. At this stage a note on the number of the victims would be useful.

Information on pregnancy or lactation should be noted but no detailed evaluation is planned until the results of other studies are available.

Weight is important, mainly for the young and the elderly. Estimation of epidemiological data will be used to assess service needs for prevention.

Predisposing factors include ethnic origin and other past medical history.

(b) Animal:

Record both the species and the number of animals.

7. Agents: (At this stage only a basic classification is planned).

The final classification of the agents will be developed subsequently. The use of a computer-based thesaurus is planned.

For multiple exposures the sequence of data input will be repeated.

The Name and Use/Description should be those given by the caller. A separate menu will be provided if the data is considered false. The use of phonetic searching and other computer assistance is planned.

The quantity should be indicated if known. Otherwise a scale of estimates may be used. "Unknown" should only be indicated as a last resort. The project will collect simple data only in cases where chronic or repeated exposure may have occurred. This may be the subject of a later study.

8. Location:

The location should be determined as accurately as possible if action is planned for prevention.

9. Circumstances:

Special circumstances to be noted include bites, stings, fires and wounds. Others could be added later.

10. Routes of exposure:

If more than one, indicate each.

11. Symptoms/Signs:

Classifications and definitions will be developed subsequently.

12. Toxicological analyses:

If toxicological analyses are negative they should still be recorded. Quantitative data should be expressed in mass units per litre or kg.

Computer assisted conversion of molar to mass SI units (and vice versa) will be valuable.

13. Other investigations:

These may also be added later.

14. Initial evaluation:

The initial evaluation will remain the final assessment unless follow-up data is obtained (see 16). If 16 is completed that data will dominate 14 unless a comparison verses 16 is requested from the computer.

15. Treatment:

An expanded list is included to permit identification of areas for action early in the project. If the centre considers that inappropriate treatment was used this should be indicated where relevant.

16. Outcome:

Definitions and classifications will be developed subsequently.

17. Final evaluation:

In addition to the classification based on follow-up data, the computer will assign grades of severity of poisoning according to a pre-determined symptoms list including symptom combinations. The approach will be to have an automatic system of multiple grading excluding subjectivity to assist case data selection and study. To be developed subsequently and tested before incorporation into the final format for the case data file.